

## CLAIMS

What is claimed is:

1. A method for motion searching each macroblock of a video frame, comprising iteratively decreasing block size until a rate-distortion (*RD*) has been minimized and selectively reducing the number of block sizes searched.
2. The method of claim 1, wherein said motion searching each block of said video frame comprises:  
selecting a largest of a plurality of available block sizes to obtain a selected block size;  
performing a motion search using said selected block size;  
calculating and storing a rate-distortion (*RD*) for said selected block size;  
comparing said *RD* for said selected block size with a *RD* for a larger block size if one exists;  
if the *RD* for said selected block is larger than said *RD* for said larger block size then a lowest *RD* block size has been found, if not, continuing;  
selecting a smaller block size if one exists; and  
repeating above starting from performing a motion search using said selected block size.

3. The method of claim 1, wherein said motion searching each block of said video frame comprises:  
 performing a motion search on said video frame relative to a previous video frame using  
 16x16, 8x16 and 16x8 block sizes;  
 calculating a rate-distortion (*RD*) for each of said 16x16, 8x16 and 16x8 block sizes;  
 if said calculated *RD* is lowest for said 16x16 block size, motion search is complete,  
 otherwise continue;  
 performing a motion search on said video frame relative to said previous video frame  
 using an 8x8 block size;  
 calculating a *RD* for said 8x8 block size;  
 if said calculated *RD* for said 8x8 block size is not lower than said calculated *RD* for said  
 said 16x16, 8x16 and 16x8 block sizes then said motion search is complete,  
 otherwise continue;  
 performing a motion search on said video frame relative to said previous video frame  
 using 4x8 and 8x4 block sizes;  
 calculating a *RD* for said 4x8 and 8x4 block sizes;  
 if neither of said calculated *RD*s for said 4x8 and 8x4 block sizes is lower than said  
 calculated *RD* for said 16x16, 8x16, 16x8 and 8x8 block sizes, then said motion  
 search is complete, otherwise continue;  
 performing a motion search on said video frame relative to said previous video frame  
 using a 4x4 block size; and  
 determining a block size with lowest calculated *RD* and motion search is complete.

4. The method of claim 3, further comprising repeating all steps for a new video frame.

5. The method of claim 1, wherein said *RD* comprises:

$$RD = n(\text{rate}) + m(\text{distortion})$$

where *n* and *m* are scalar values.

6. The method of claim 5, wherein *rate* comprises a number of bits of storage required for macroblock overhead.

7. The method of claim 5, wherein *distortion* comprises a sum of absolute differences.

8. A method for compressing motion video images comprising:  
inputting a video frame;  
performing a motion search on each macroblock of said video frame including iteratively  
decreasing block size until a rate-distortion (*RD*) has been minimized;  
storing a motion vector for each block in said video frame; and  
residual coding of motion compensated errors.

9. The method of claim 8, further comprising repeating all steps for a new video frame.

10. The method of claim 8, wherein said performing said motion search on each macroblock of said video frame further comprises:  
selecting a largest of a plurality of available block sizes to obtain a selected block size;  
performing a motion search using said selected block size;  
calculating and storing a rate-distortion (*RD*) for said selected block size;  
comparing said *RD* for said selected block size with a *RD* for a larger block size if one exists;  
if the *RD* for said selected block is larger than said *RD* for said larger block size then a lowest *RD* block size has been found, if not, continuing;  
selecting a smaller block size if one exists; and  
repeating above starting from performing a motion search using said selected block size.

11. The method of claim 8, wherein said performing said motion search on each macroblock of said video frame comprises:  
 performing a motion search on said video frame relative to a previous video frame using 16x16, 8x16 and 16x8 block sizes;  
 calculating a rate-distortion (*RD*) for each of said 16x16, 8x16 and 16x8 block sizes;  
 if said calculated *RD* is lowest for said 16x16 block size, motion search is complete, otherwise continue;  
 performing a motion search on said video frame relative to said previous video frame using an 8x8 block size;  
 calculating a *RD* for said 8x8 block size;  
 if said calculated *RD* for said 8x8 block size is not lower than said calculated *RD* for said 16x16, 8x16 and 16x8 block sizes then said motion search is complete, otherwise continue;  
 performing a motion search on said video frame relative to said previous video frame using 4x8 and 8x4 block sizes;  
 calculating a *RD* for said 4x8 and 8x4 block sizes;  
 if neither of said calculated *RD*s for said 4x8 and 8x4 block sizes is lower than said calculated *RD* for said 16x16, 8x16, 16x8 and 8x8 block sizes, then said motion search is complete, otherwise continue;  
 performing a motion search on said video frame relative to said previous video frame using a 4x4 block size; and  
 determining a block size with lowest calculated *RD* and motion search is complete.

12. The method of claim 8, wherein said *RD* comprises:

$$RD = n(\text{rate}) + m(\text{distortion})$$

where *n* and *m* are scalar values.

13. The method of claim 12, wherein *rate* comprises a number of bits of storage required for macroblock overhead.

14. The method of claim 12, wherein *distortion* comprises a sum of absolute differences.

15. A system for transmitting and receiving video images, comprising:  
a processor configured for processing computer instructions and a memory for storing  
said computer instructions; and  
wherein said computer instructions implement a method for compressing motion video  
images, comprising:  
inputting a video frame;  
performing a motion search on each macroblock of said video frame including  
iteratively decreasing block size until a rate-distortion (*RD*) has been  
minimized;  
storing a motion vector for each block in said video frame; and  
residual coding of motion compensated errors.

16. The system of claim 15, wherein said performing said motion search on  
each macroblock of said video frame further comprises:  
selecting a largest of a plurality of available block sizes to obtain a selected block size;  
performing a motion search using said selected block size;  
calculating and storing a rate-distortion (*RD*) for said selected block size;  
comparing said *RD* for said selected block size with a *RD* for a larger block size if one  
exists;  
if the *RD* for said selected block is larger than said *RD* for said larger block size then a  
lowest *RD* block size has been found, if not, continuing;  
selecting a smaller block size if one exists; and  
repeating above starting from performing a motion search using said selected block size.

17. The system of claim 15, wherein said performing said motion search on each macroblock of said video frame further comprises:  
performing a motion search on said video frame relative to a previous video frame using 16x16, 8x16 and 16x8 block sizes;  
calculating a rate-distortion (*RD*) for each of said 16x16, 8x16 and 16x8 block sizes;  
if said calculated *RD* is lowest for said 16x16 block size, motion search is complete, otherwise continue;  
performing a motion search on said video frame relative to said previous video frame using an 8x8 block size;  
calculating a *RD* for said 8x8 block size;  
if said calculated *RD* for said 8x8 block size is not lower than said calculated *RD* for said 16x16, 8x16 and 16x8 block sizes then said motion search is complete, otherwise continue;  
performing a motion search on said video frame relative to said previous video frame using 4x8 and 8x4 block sizes;  
calculating a *RD* for said 4x8 and 8x4 block sizes;  
if neither of said calculated *RD*s for said 4x8 and 8x4 block sizes is lower than said calculated *RD* for said 16x16, 8x16, 16x8 and 8x8 block sizes, then said motion search is complete, otherwise continue;  
performing a motion search on said video frame relative to said previous video frame using a 4x4 block size; and  
determining a block size with lowest calculated *RD* and motion search is complete.

18. The system of claim 15, wherein said *RD* comprises:

$$RD = n(rate) + m(distortion)$$

where *n* and *m* are scalar values.

19. The system of claim 18, wherein *rate* comprises a number of bits of storage required for macroblock overhead.

20. The system of claim 18, wherein *distortion* comprises a sum of absolute differences.

21. The system of claim 15, further comprising an input device in communication with said processor for capturing video images.

22. The system of claim 15, wherein said system is further configured to communicate over a network.